FISH SCREENING FEASIBILITY

CALFED
BAY-DELTA
PROGRAM

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Memorandum

Date: August 25, 1997

To: BDAC Members

From: Lester A. Snow Sharon Shoop for
Executive Director

Subject: Fish Screening Feasibility

Summary

An interagency Fish Facilities Technical Team was assembled to investigate and make recommendations to CALFED on the major fish passage facilities and issues associated with the CALFED Bay-Delta Program Alternatives. The team was composed of multidisciplinary agency fish passage experts representing Department of Water Resources (DWR), Department of Fish and Game (DFG), National Marine Fisheries Service (NMFS), Bureau of Reclamation (USBR), U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), U.S. Environmental Protection Agency (USEPA) and an independent nationally known advisory panel.

The committee's focus was primarily in three areas:
- How large a fish screen is technically feasible at a Sacramento River diversion location?
- What type of fish screen configuration is technically feasible in the South Delta?
- Other fish passage issues associated with verifying the technical feasibility of screening the various Program alternatives.

General recommendations for the CALFED alternative fish facilities were made along with specific recommendations for North Delta diversion screens, South Delta screen facilities, and future informational needs.

Based on the Fish Facilities Team Analysis and their collective professional judgement, there are no technical limitations to constructing fish protection facilities for anything up to 15,000 cfs diversion capacity. However, the largest screening facility in existence

with full positive physical barrier exclusionary screens (with a slot opening of 3/32 inch) is 3,000 cfs. Therefore, breaking the facility into a series of smaller screens (multiple bay units of say 3,000 cfs) is preferable. In addition, there are hydraulic and fish exposure issues that are better addressed by this smaller size unit. For comparison both the Skinner Fish Facility and the Tracy Fish Facility screen more water but they use a louver behavioral guidance system (vertical bars with 1-inch openings).

For a South Delta diversion, the facility type could be the same as considered in the North, except that additional provisions for debris and extreme flow variables must be incorporated. Any new fish facilities contemplated for Clifton Court Forebay (CCF) should be placed at the intake to minimize predation. Although there was not a specific disagreement amongst the Team, there was not consensus that a screen capable of supplying the full capacity of the SWP and CVP diversion inflows could be built in the CCF or the surrounding South Delta. Presently, CCF is filled on the tidal cycle when the forebay water level is below that of the adjacent channel. Due to this tidal filling, the intake flows into the forebay are significantly higher than the pumping capacity. These flows can be up to 30,000 cfs at high tides. The screens will likely have to be sized 50 to 100 percent larger than the pumping capacity when placed at the CCF intake site to overcome CCF inflow (around 25,000 to 30,000 cfs).

Individual committee members also made recommendations of fish passage facilities and issues on each of the CALFED Phase II alternatives.

Action - Information Item

This agenda item is for update/information only following requests at the July 22 BDAC meeting for additional information on the feasibility of large-scale fish screens.

Detailed Discussion

The Team was assembled in May 1996 and jointly chaired by Dan Odenweller (DFG) and Darryl Hayes (DWR). The agency and consulting staff (Team members) were involved in each of the approximately quarterly workshops. Three outside fish facility experts were selected by the co-chairs and approved by the larger Team to provide balance and expertise on the facility alternatives and recommendations.

In addition to the organization and charge of the larger Fish Facility Team meetings, a smaller group was convened in spring 1997 to establish better communications between

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CALFED staff and a subgroup of the Fish Facilities Team. This smaller group dealt with the detail facilities and planning developments specific to the 17 alternatives being considered in Phase II of the CALFED Program, while the larger group was charged with determining the technical feasibility of screening at two general areas (i.e. north and south Delta). This group met on three occasions during April and May 1997 and was effective in helping CALFED and the Technical Team communicate with each other on the issues and needs.

Several informational documents, "white papers", management questions, modeling results and presentations were prepared for each of the workshops. These documents as well as material prepared for previous evaluations of Delta alternative facilities (such as the "Peripheral Canal," the "North and South Delta Program," and the "Five Agency Salmon Team" evaluations) were used in building a foundation for a set of recommendations to CALFED on Fish Facilities planning.

Some of the major factors that the committee considered in its review were:

- Species to be protected
- Size of fish to be protected
- Hydrodynamic conditions
- Existing aquatic habitat
- Screen approach velocity requirements
- Screen sweeping velocity requirements
- Screen cleaning requirements
- Bypass requirements
- Fish salvage requirements
- Debris management
- Sedimentation management
- Upstream passage
- Best feasible technology

After the Team reviewed and discussed the fish facility issues and design concepts being considered, a set of Team consensus recommendations was developed and is incorporated in the committee's July 28, 1997 status report "Fish Screening and Passage Analysis of the CALFED Bay-Delta Program Phase II Delta Conveyance Alternatives". Copies of earlier in-progress drafts were valuable to the Program Team in its formulation and analysis of alternatives. This document was thoroughly reviewed by the Team and can be used to assist CALFED in further developing and narrowing the alternatives from their perspective.

The conceptual design of the proposed fish passage facilities (juvenile and adult) relied on the vast experiences of the fish facility experts and investigations into several existing fish facilities. Some of the projects these concepts were based on included the proposed Glenn-Colusa Irrigation District Screen (3000 cfs), the Tehama-Colusa Canal diversion (3,000 cfs), the Red Bluff Research Pumping Plant, the Tracy Fish Facility Investigations and several new fish screens in the Northwest. Conceptual renderings of proposed north and south Delta fish facilities are shown on Figures 1 and 2.

Although the Team considered several screening concepts and focused many of its recommendations on one particular design (the off-channel multiple bay design with fish bypasses), it is important to understand that there are other factors that may influence this option and the reasons behind that choice. No screening facility has been or can be constructed and operated without some negative impacts. This will also be true of all proposed facilities, especially considering their scale and inclusion of elements that have limited track records (e.g. "fish friendly" pumps). In general, the greater the flow diverted the greater the impact. These impacts are due to the screening and bypass process itself and are in addition to the impacts of removing water from a river system. Some of the key information that is needed before any concept can be finalized and detailed follows:

General Management Questions and Goals - What are the management goals for the species in question? How much operational flexibility should be built into the fish facility operation? What species and life stages should be protected? What are the anticipated range of water delivery schedules and curtailment criteria on a month-by-month basis? Do these variables change on any given water year type?

Fish Species - As a basis of design one needs to know the fish species for which the screens will be designed. The species, life stages, and timing of their presence in the area of the proposed intake must be agreed to by all agencies (i.e delta smelt). A multi-year preproject field program might be required.

Set Screen Performance Goals and Criteria - This is extremely important. The goals and criteria must be agreed to by all participants. Since many stakeholders are involved in the process, to set the criteria it must be started early and must be completed before design can begin. Standard NMFS and CDFG criteria might not apply depending on the design species selected. Should facilities be designed for fish protection of all species under all circumstances at all times? Could "Real Time Monitoring" or other criterion be used to operate a facility that might operate "out of spec"?

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Hydraulic Data - A lot of the hydraulic data gathering is complete, but more information will be necessary. Boundary conditions for facility simulation models (physical and numerical) will require detailed hydrodynamic data. More site specific hydraulic models will be required at the end of the preliminary design phase.

Criteria - Fish screen velocity criteria needs to be developed for Delta species. Operational considerations for emergency situations should be factored into criteria. All agencies and stakeholders must buy into the criteria prior to design. If in design it is found that some criteria must be changed, all agencies and stakeholders must agree to the change.

Until further development of the alternatives and flow criteria are established, several concepts, such as "In-River" screens at multiple diversion points, or new applications of new technologies may be reconsidered. These options generally have site specific limitations, flow requirements, operational concerns or will require long lead times to develop the necessary biological or hydraulic criteria. Therefore, the Team decided to focus on a concept that we all believed would be the most flexible and adaptive as well as not going too far beyond our current understanding and screening criteria developed for larger fish screen structures. This approach helped the committee focus on the question of feasibility, research needs and significant issues.

The Team will continue to meet on an approximately quarterly basis, or as necessary, as the CALFED Bay-Delta Alternatives are refined. With new information, the Team will review and investigate refined concepts, determine construction sequencing or phasing options, develop specific testing or focused research programs, perform hydraulic and operational models, and report findings to CALFED.

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